PRICE $5.00

FEB 25 1963

VOLTAGE REGULATED
POWER SUPPLY

MODEL SM 160-4MX

SERIAL NO. .....

OFFICIAL RECORDS STATION
FILE COPY
FACILITIES FEB 25 1971

QC CAL CERT
PROCEDURES
GROUP COPY

INSTRUCTION MANUAL

kepco inc.®

131-38 SANFORD AVENUE • FLUSHING 52, N. Y.
Area Code 212 IN 1-7000 • TWX # NY 4-5196

INSTRUCTION MANUAL

VOLTAGE REGULATED
POWER SUPPLY

MODEL SM 160-4MX

SERIAL NO. .....

QC CAL/CERT
PROCEDURES
GROUP COPY

KEPCO, INC.
VOLTAGE REGULATED POWER SUPPLY MODELS SM 160-4X, -4MX

SECTION A

A-1 ELECTRICAL AND PHYSICAL SPECIFICATIONS.

....DC OUTPUT:
0-160 volts; continuously variable output control.

0-4 amperes, continuous duty.

....AC INPUT:
105-125 volts, 60 ± 1/2 cps; 10.2 amperes, maximum.

....REGULATION -

- LINE: Within 0.01% of the output voltage setting in the specified range for line change of 105-125 v ac.

- LOAD: Within 0.01% of the output voltage setting in the specified range, or 0.001 v, whichever is greater, for load change of 0-4 amperes, REMOTE ERROR SENSING feature provides means of maintaining specified regulation directly at load. (See Section C)

....RIPPLE:
Less than 0.001 volt rms.

....STABILITY:
Output voltage variation is less than 0.01% or 0.002 v, whichever is greater, over a period of 8 hours after unit has reached equilibrium. Approximately 3/4 hour is required for this unit to reach equilibrium from a "cold" start.

....OUTPUT IMPEDANCE:
Less than 0.04 ohm from DC to 1 KC.
Less than 0.4 ohm from 1 KC to 100 KC.

....RECOVERY TIME:
50 microseconds; defined as the time required for the output voltage to return to within 0.1 volt of the output voltage setting.

....TEMPERATURE COEFFICIENT:
Output voltage changes less than 0.01% per degree C.

....AMBIENT OPERATING TEMPERATURE:
-20 C to +50 C maximum.

....STORAGE TEMPERATURE:
-40 C to +85 C.

A-2 TERMINALS AND CONTROLS -

- ON FRONT PANEL.

....DC OUTPUT and GROUND binding posts, clearly marked. Output terminals isolated from chassis; either positive or negative terminal may be grounded.

....VOLTAGE CONTROL, adjusts the output voltage over the range 0-160 V.

- AT REAR OF UNIT.

....DC OUTPUT and GROUND binding posts, clearly marked; connected internally to respective front panel binding posts.

....REMOTE ERROR SENSING binding posts provide means of connecting output to maintain specified regulation directly at remote load terminals.

A-3 PROTECTIVE FEATURES -

....POWER INPUT FUSE (ac) on front panel.

....DC OUTPUT FUSE on front panel.

....REFERENCE FUSE (ac) for internal circuitry.

....OVERLOAD PROTECTION:
Inherent current limiting action of Kepco "FLUX-O-TRAN" transformer permits momentary short circuit of output without damage to unit. Continuous overload or short circuit will open the DC OUTPUT FUSE.

....OVERTEMPERATURE PROTECTION:
Thermostat relay control turns unit OFF if temperature of PASS elements exceeds safe limit. Relay is reset by interrupting input power with ON-OFF switch on front panel, or by disconnecting line cord.

SECTION B

BRIEF THEORY:

Two circuit schematic drawings titled "POWER UNIT" and "CONTROL UNIT" are included in the Reference Index of this instruction manual. These drawings contain designations corresponding to the capitalized terms in the following discussion.

Some basic functional relationships in this power supply are illustrated in block Diagram B-1 (Page B-2A).

The POWER UNIT includes:

DC SOURCES:

....MAIN SUPPLY - (consisting of a Kepco "Flux-O-Tran" transformer, full wave bridge rectifier, and capacitive filter) provides line regulated DC power for the output, via the PASS CIRCUITRY.

....AUXILIARY SUPPLIES: COLLECTOR SUPPLY (negative full wave rectified) for PASS CIRCUITRY driver stages not connected to MAIN SUPPLY; I_{CO} SUPPLY (full wave rectified) compensates for spurious biasing effects of collector leakage current; RETURN SUPPLY (full wave rectified) acts as leakage current path for series pass transistors and as bleed path to provide minimum operating current for pass transistors; CONTROL UNIT SUPPLY (full wave rectified).

PASS CIRCUITRY:

The power transistors which function as pass elements (i.e. are in series with the load) may be regarded effectively as variable resistors (or conductors) controlled by a CONTROL SIGNAL. The current "passed" by these elements is a function of the emitter-base bias. The CONTROL SIGNAL is applied to the base terminal; hence a negative CONTROL SIGNAL will aid the forward conduction of a PNP transistor while a positive CONTROL SIGNAL will reduce the forward conduction. In response to the CONTROL SIGNAL the pass elements effect a current and voltage distribution in the main DC loop which holds the output voltage constant.

The CONTROL UNIT includes:

REFERENCE CIRCUITRY:

The function of the REFERENCE CIRCUITRY is to maintain a precise, stable, voltage standard for the COMPARISON AMPLIFIER.

COMPARISON AMPLIFIER:

The COMPARISON AMPLIFIER is essentially a series of cascaded transistor amplifiers which boost the differential error signal produced in the COMPARISON BRIDGE to a level sufficient to drive the PASS CIRCUITRY. The COMPARISON AMPLIFIER is connected across the COMPARISON BRIDGE from the junction of the VOLTAGE CONTROL and the REFERENCE RESISTANCE to the junction of the REFERENCE DIODE and the negative output terminal (See Diagram on Page B-2A). This arrangement is similar to that of a null galvanometer across a Wheatstone bridge. Unbalance in the COMPARISON BRIDGE is amplified to produce a CONTROL SIGNAL of suitable magnitude and phase to effect corrective action by the PASS CIRCUITRY.

COMPARISON BRIDGE: (See Diagram B-2, Page B-2A).

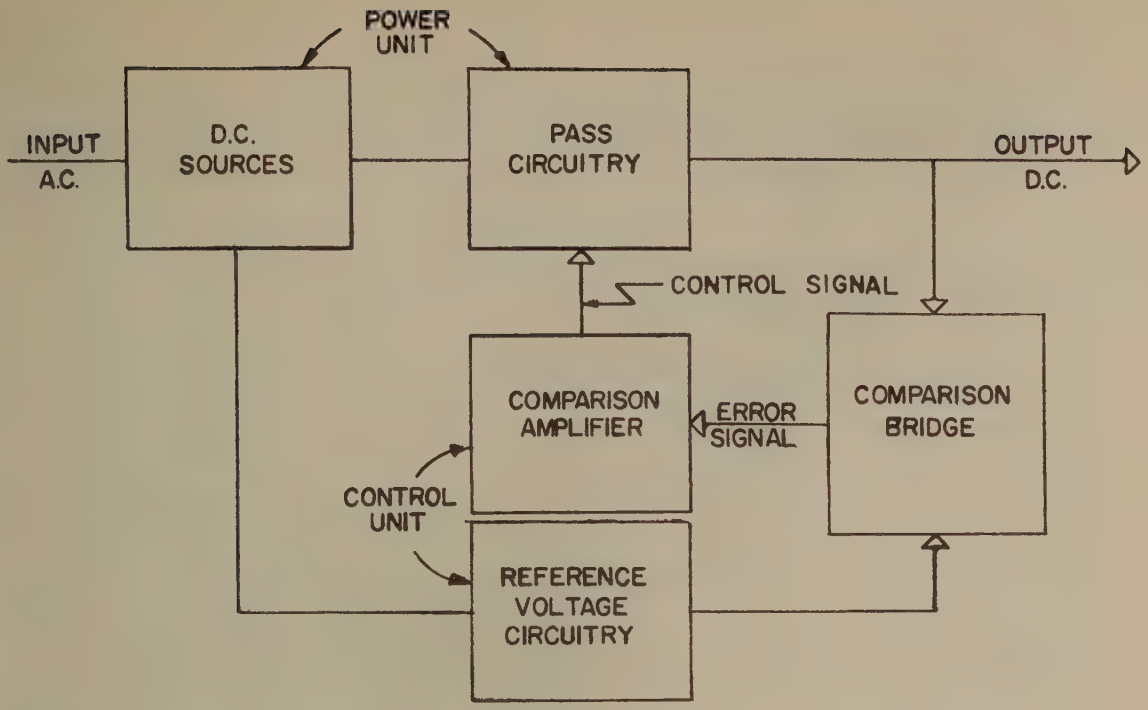
This bridge circuit implements the comparison between the OUTPUT VOLTAGE and the REFERENCE VOLTAGE. The signal produced by the comparison drives the COMPARISON AMPLIFIER.

Balance occurs in the Comparison Bridge when the following ratios are equal:

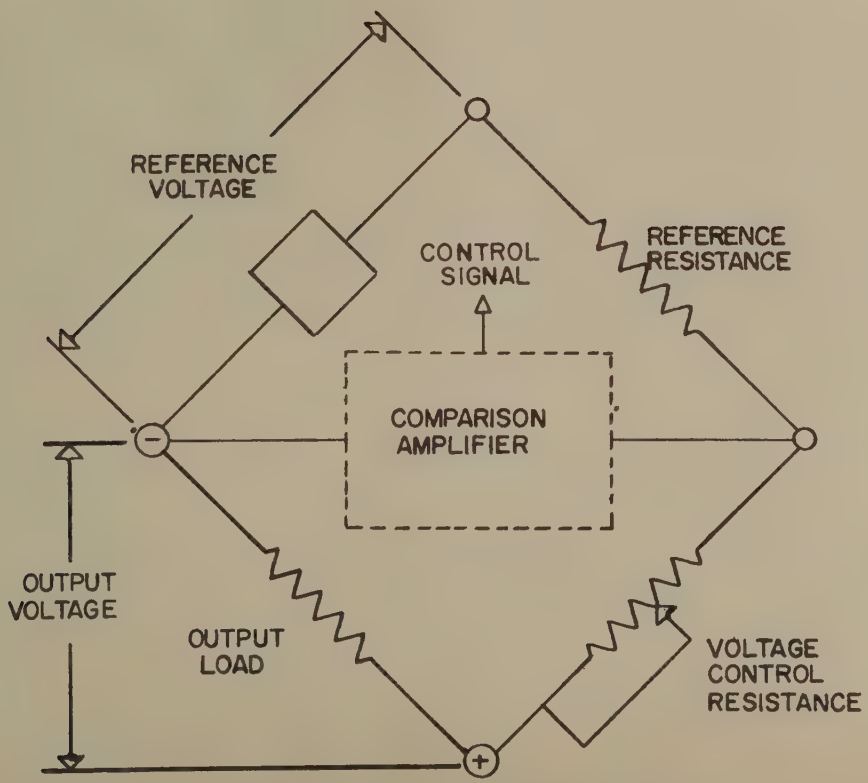
$$\frac{\text{Output Voltage}}{\text{Voltage Control Resistance}} = \frac{\text{Reference Voltage}}{\text{Reference Resistance}}$$

When, for example, the Comparison Bridge is unbalance by a decreasing output voltage drop across the load, it gives rise to a negative signal at the base of the COMPARISON FOLLOWER in the COMPARISON AMPLIFIER circuit. This signal is amplified in cascade and communicated to the pass elements as a negative base input aiding their forward conduction and consequently increasing the output voltage.

A bridge unbalance caused by an increasing output voltage produces, of course, a chain of oppositely biased circuit responses which reduce the voltage across the load.



(DIAGRAM B-1) *VOLTAGE REGULATED POWER SUPPLY*



(DIAGRAM B-2) *COMPARISON BRIDGE*

This power supply is shipped without any internal packing material; and may be put into operation immediately. It is designed for rack and for bench use. Carrying handles are provided on front panel.

....INTIAL "TURN - ON" PROCEDURE:

1. Adjust VOLTAGE CONTROL to approximate mid-range position.
2. With POWER ON-OFF switch set in "OFF" position, connect line cord to 115 v ac, 60 cps input power. If outlet is not polarized use 3 to 2 - prong adapter supplied with unit.
3. Set POWER ON-OFF switch to "ON" position.
4. Adjust VOLTAGE CONTROL to obtain desired output voltage.

....GENERAL OPERATION:

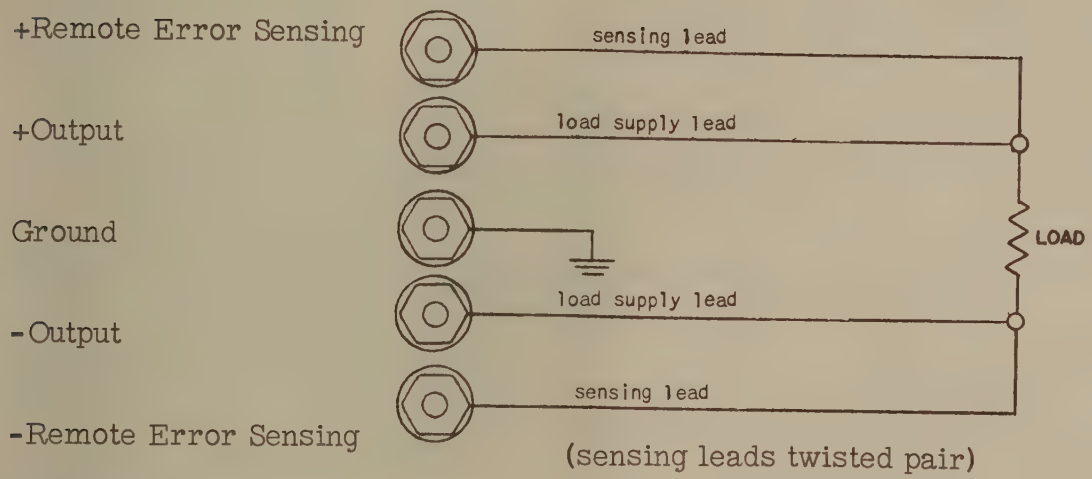
1. Once it has been determined that the unit is functioning satisfactorily, it is subsequently unnecessary to follow the INITIAL TURN-ON PROCEDURE.
2. The VOLTAGE CONTROL may be left fixed at any setting and the power turned "ON" and "OFF" without any harmful effects.

....MAINTENANCE AND REPAIR:

1. Under normal operating conditions, no mechanical maintenance of any kind should be required. Conservatively rated electrical components assure long trouble-free operating life.
2. Exceptional component accessibility, provided by resistor board construction and plug-in sub-assemblies, facilitates servicing, should it be required. It is emphatically recommended that trouble-shooting be handled by personnel highly familiar with transistor circuitry, - preferably with experience in closed-loop designs.
3. This unit should not be returned to the manufacturer without proper authorization and shipping instructions. In any correspondence with the factory regarding repair, the model, serial number, and symptoms of malfunction must be included.

REMOTE ERROR SENSING OPERATION

(Terminal Connections)



(Procedure)

1. With AC input power disconnected, remove jumpers between plus and minus Output terminals and Remote Error Sensing terminals on the rear of the unit.

2. Using twisted pair wire, connect sensing leads from positive and negative Remote Error Sensing terminals to the load (observing polarities).

3. Using twisted pair wire, connect load supply leads from positive and negative Output terminals.

IMPORTANT NOTE: This unit should not be operated with Remote Error Sensing if the voltage drop across the load supply leads exceeds 0.5 volt (maximum) per lead at maximum rated output current.

Schematic Part No.	Kepco Part No.	Description	Specifications	Mfr.	Mfr's. No.
B201	149-0013	Fan, Venturi		Rotron	Muffin Fan
		Capacitories:			
C201, 202	117-0248	Electrolytic, Can Type	2.5 K µf 225 v +50, -10%	Industrial Cond.	20B328
C204	117-0280	Paper, Can Type	8 µf 660 v ac 5%	Industrial Cond.	2465-SVR
C206	117-0207	Mylar	1 µf 200 v 10%	Hopkins Eng.	2P2M
C301	117-0163	Ceramic	0.05 µf 500 v 20%	Sprague	36C142A1
C302	117-0147	Electrolytic, Pigtail Type	10 µf 150 v +50, -10%	Industrial Cond.	10B912RM
C401	117-0114	Electrolytic, Pigtail Type	350 µf 50 v+100, -10%	Industrial Cond.	1B844
C402	117-0222	Electrolytic, Pigtail Type	100 µf 200 v +50, -10%	Industrial Cond.	20B317RM
C403, 404	117-0221	Electrolytic, Pigtail Type	500 µf 50 v+100, -10%	Industrial Cond.	1B1163RM
C405, 406	117-0163	Ceramic	0.05 µf 500 v 20%	Sprague	36C142A1
C501	117-0102	Electrolytic, Pigtail Type	60 µf 250 v +50, -10%	Industrial Cond.	20B296
C502	117-0208	Mylar	0.5 µf 600 v 20%	Hopkins Eng.	P56M
		Rectifiers:			
CR201	124-0131	Silicon, Stack Type		Kepco	124-0131
CR301, 302	124-0028	Silicon, Pigtail Type		Automatic Mfg.	PT-5
CR401, 402 405-408	124-0084	Silicon, Pigtail Type		Transitron	SL-91
CR403, 404	124-0028	Silicon, Pigtail Type		Automatic Mfg.	PT-5
F101	141-0010	Fuse, Instantaneous	15 a	Bussmann	ABC-15
F102	141-0039	Fuse, Slow-Blow	6 a	Bussmann	MDX-6-1/4
F401	141-0012	Fuse, Instantaneous	2 a	Bussmann	AGC-2

Schematic Part No.	Kepco Part No.	Description	Specifications	Mfr.	Mfr's. No.
M101	135-0153	Meter	200 v dc 2-1/2"	Gen. Elec.	8DW91V218AW2
M102	135-0152	Meter (Model SM160-4M, MX only)	4 a dc 2-1/2"	Gen. Elec.	8DW91A226BS2
PL101	153-0024	Pilot Light		Gen. Elec.	NE-51
Q301	119-0022	Transistor, PNP		Tung-Sol	2N382
Q302	119-0034	Transistor, PNP		Delco	2N1172
		Resistors:			
R201	115-0513	Fixed, Power, Strip	1 K Ω 40 w 5%	Ward Leonard	40S1000
R202	115-0964	Fixed, Power, Strip	15 Ω 20 w 5%	Ward Leonard	20S15
R203	115-0957	Fixed, Power, Strip	25 Ω 30 w 5%	Ward Leonard	30S25
R204, 210	115-0977	Fixed, Power, Strip	1.5 K Ω 40 w 5%	Ward Leonard	40S1500
R205	115-0910	Fixed, Power, Strip	3 K Ω 20 w 5%	Ward Leonard	20S3000
R206-208	115-1016	Fixed, Power, Ribbon	0.75 Ω 40 w 5%	Ward Leonard	HH2BR-35-0.75Ω 5%
R209	115-0962	Variable, Wire Wound	20 K Ω 2.5 w 5%	Gen. Radio	973-P
R211, 212	115-0718	Fixed, Molded	47 Ω 1/2 w 10%	Allen-Bradley	EB4701
R213	115-0681	Fixed, Molded	33 Ω 1/2 w 10%	Allen-Bradley	EB3301
R214	115-1096	Variable, Wire Wound	200 Ω	Gen. Radio	971
R215	115-0502	Fixed, Molded	10 Ω 1/2 w 10%	Allen-Bradley	EB1001
R301	115-0875	Fixed, Power, Axial	40 Ω 3 w 5%	Ward Leonard	3X40
R302	115-0979	Fixed, Molded	470 Ω 1 w 5%	Allen-Bradley	GB4715
R303	115-0559	Fixed, Molded	5.6 K Ω 1/2 w 5%	Allen-Bradley	EB5625
R304	115-0960	Fixed, Molded	1 K Ω 1 w 5%	Allen-Bradley	GB1025
R305	115-0803	Fixed, Power, Axial	200 Ω 3 w 5%	Ward Leonard	3X200
R306	115-0341	Fixed, Molded	100 Ω 1/2 w 5%	Allen-Bradley	EB1015
R307	115-0250	Fixed, Molded	330 K Ω 1/2 w 5%	Allen-Bradley	EB3345
R308	115-0512	Fixed, Power, Axial	1 K Ω 5 w 5%	Ward Leonard	5X1000WL
R309	115-0809	Fixed, Molded	100 K Ω 1/2 w 10%	Allen-Bradley	EB1041

Schematic Part No.	Kepco Part No.	Description	Specifications	Mfr.	Mfr's. No.
RL 201	140-0040	Relay, Plug-In	3PDT	Kurman	26D3C
S101	127-0107	Switch, Toggle		Carling	AA252-71-2
T201	100-1183A	Transformer, Flux-O-Tran		Kepco Magnetics	100-1183A
T202	175-0331	Transformer, Variable		Superior	Q116U
AO/441-10	110-0114	PASS ASSEMBLY (STAT) Includes the following:			
1 ea.	119-0016	Transistor, PNP		Delco	2N441-10**
2CO.2/SP67A	110-0117	PASS ASSEMBLY (STAT) Includes the following:			
2 ea.	115-0891	Resistor, Fixed, Power, Axial	0.2 ohms 5 w 5%	Ward Leonard	7/8"-Y-O.2-Axiohm-5%
2 ea.	119-0036	Transistor, PNP		Motorola	SP67A*
2CO.2TC/SP67A	110-0119	PASS ASSEMBLY (STAT) Includes the following:			
2 ea.	115-0891	Resistor, Fixed, Power, Axial	0.2 ohms 5 w 5%	Ward Leonard	7/8"-Y-O.2-Axiohm-5%
1 ea.	127-0093	Switch, Thermostat	Normally closed	Chatham	DRSCORP73C
2 ea.	119-0036	Transistor, PNP		Motorola	SP67A*

* = Field Replacement: Motorola 2N1165

** = This is Delco Type 2N441 tested and selected by Kepco to our specification 2N441-10.

kepco inc.®

REPLACEMENT PARTS LIST

Control Unit, Model TRAM 31

SCHEMATIC NO.	QTY.	DESCRIPTION	MFRS. NAME & PART NO. (See Note)	KEPCO PART NO.
C1	1	Capacitor, Electrolytic 10 µf, 50v; Pigtail	Industrial 05RM10	117-0136
C2	1	Capacitor, Mylar 2 µf, 200v	Hopkins 2P2M	117-0129
C3	1	Capacitor, Mylar 0.5 µf, 200v	Hopkins	117-0123
CR1,2	2	Rectifier, Silicon, Pigtail 500 ma, 100 PIV	Transitron SL-91	124-0084
L1	1	Choke, RF 550 microhenry	Miller 4649	176-0046
Q1	1	Transistor, PNP Equal to 2N1172	Delco 119-0034	119-0034
Q2-6; 8,10	7	Transistor, PNP Equal to 2N382	Tung-Sol 119-0022	119-0022
Q7,9	2	Transistor,NPN	General Transistor 119-0007	119-0007
R1,5	2	Resistor, Fixed, Molded 3.3 K ohms, 1/2w; 5%	Allen Bradley EB3325	115-0452
R2, 14	2	Resistor, Fixed, Molded 2.7 K ohms, 1/2w; 10%	Allen Bradley EB2721	115-0560
R3,4	2	Resistor, Fixed, Precision 500 ohms, 1w; 1%	Sage Electronics SAIW	115-1192
R6,7	2	Resistor, Fixed, Molded 6.8 K ohms, 1/2w; 5%	Allen Bradley EB6825	115-0579
R8	1	Resistor, Fixed, Precision 15K, 1/2w; 1%	Dale WS 1/2	115-0646
R9	1	Resistor, Power, Axial, WW 10 K ohm, 3w; 5%,LTC	Hardwick Hindle 9/16 GA	115-1162
R10	1	Resistor, Power, Axial 2.5 K ohms, 3w; 5%, WW	Ward Leonard 3X2500	115-0469
R11	1	Resistor, Fixed, Precision 400 ohms, 1w; 1%	Sage Electronics SAIW	115-1191

REPLACEMENT PARTS MAY BE ORDERED FROM KEPCO, INC. ORDERS SHOULD INCLUDE KEPCO PART NUMBER AND DESCRIPTION.

PLEASE NOTE: THE MANUFACTURER'S NAME AND PART NUMBER LISTED FOR EACH ITEM ON REPLACEMENT PARTS LISTS, REPRESENTS AT LEAST ONE SOURCE FOR THAT ITEM AND IS LISTED SOLELY FOR THE CONVENIENCE OF KEPCO EQUIPMENT OWNERS IN OBTAINING REPLACEMENT PARTS LOCALLY. WE RESERVE THE RIGHT TO USE EQUIVALENT ITEMS FROM ALTERNATE SOURCES. KEPCO, INC.

SCHEMATIC NO.	QTY.	DESCRIPTION	MFRS. NAME & PART NO. (See Note)	KEPCO PART NO.
R12 *Note 1	*	Resistor, Fixed, Precision 800 ohms, 1/2w; 1%	Sage Electronics 1050S	115-1193
R12 *Note 2	*	Resistor, Fixed, Precision 700 ohms, 1/2w; 1%	Sage Electronics 1050S	115-1194
R12 *Note 3	*	Resistor, Fixed, Precision 900 ohms, 1/2w; 1%	Sage Electronics 1050S	115-1195
R13	1	Resistor, Power, Axial 500 ohms, 3w; 5%, LTC	Ward Leonard 3X500 LTC	115-0938
R15	1	Resistor, Fixed, Molded 20 ohms, 1/2w; 5%	Allen Bradley EB2005	115-0508
R16	1	Resistor, Fixed, Molded 160 K ohms, 1/2w; 5%	Allen Bradley EB1645	115-1024
R17	1	Resistor, Fixed, Molded 10 K ohm, 1/2w; 5%	Allen Bradley EB1035	115-0249
R18	1	Resistor, Fixed, Molded 300 ohms, 1/2w; 5%	Allen Bradley EB3015	115-0783
R19	1	Resistor, Power, Axial, WW 250 ohms, 3w; 5%, LTC	Hardwick Hindle 9/16 GA	115-1161
R20,24	2	Resistor, Power, Axial, WW 10 ohms, 3w; 5%, LTC	Hardwick Hindle 9/16 GA	115-1160
R21	1	Resistor, Fixed, Molded 100 ohms, 1w; 5%	Allen Bradley GB1015	115-0902
R22	1	Resistor, Variable, Multiturn 200 ohms, 1/4 w; 10%,25 t	Bourns Labs Trimit 271-1-201	115-0863
R23	1	Resistor, Fixed, Molded 180 ohms, 1/2w; 5%	Allen Bradley EB1815	115-0807
R25	1	Resistor, Fixed, Molded 10 ohms, 1/2w; 10%	Allen Bradley EB1001	115-0818
RD1	1	Reference Diode Zener, 6.2v, 10 ma	Hoffman IN429	121-0001

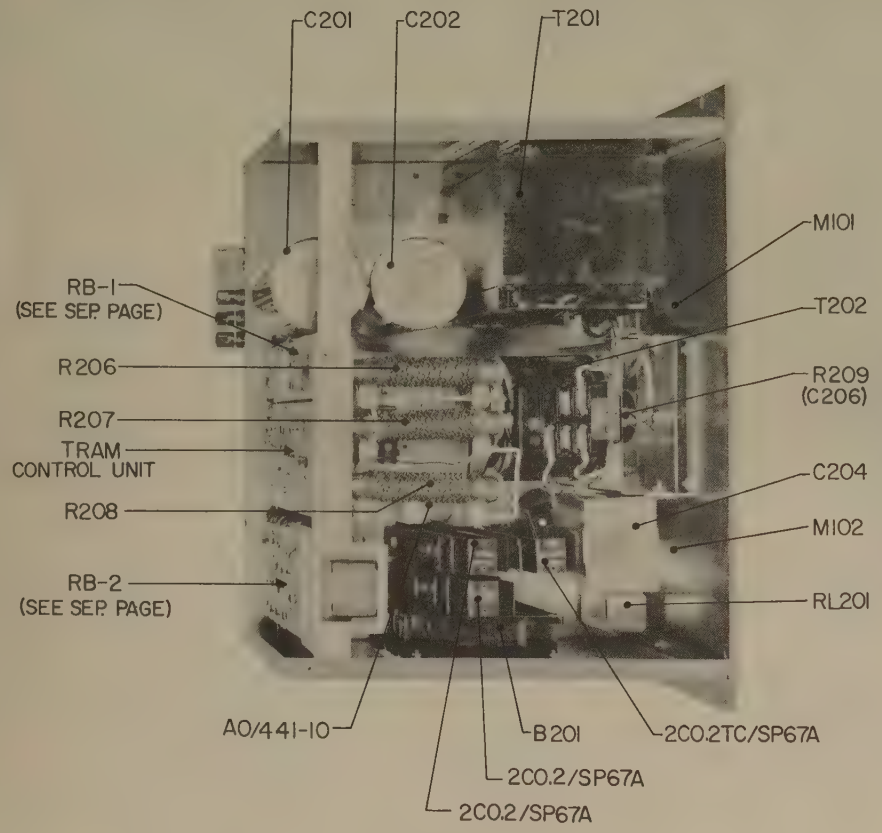
*Note 1- R12 is 800 ohms, Part no. 115-1193 in following Models:
SM 14-7X; SM 14-15X; SM 14-30X; SM 36-5X; SM 36-10X; SM 36-15X

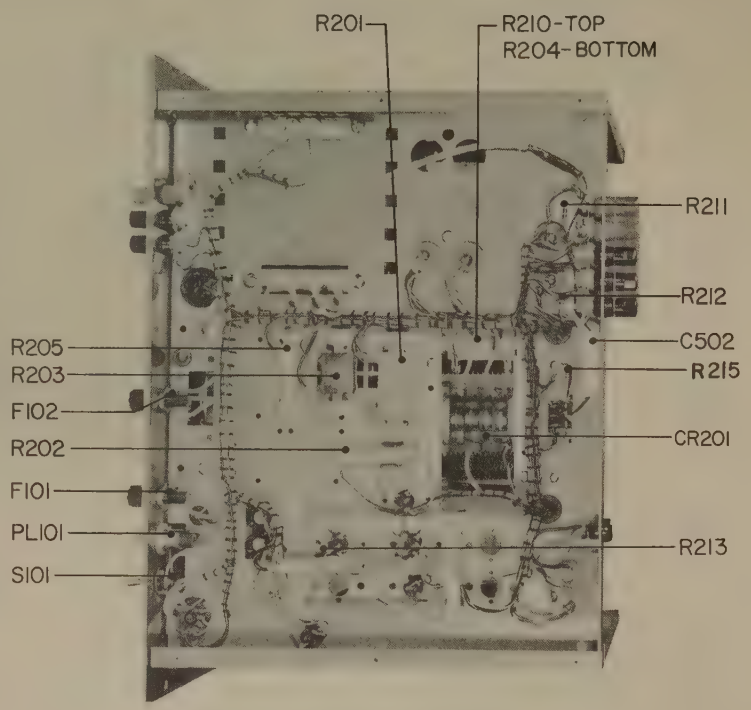
*Note 2- R12 is 700 ohms, Part no. 115-1194 in following Models:
SM 75-2X; SM 75-5X; SM 75-8X; SM 160-1X; SM 160-2X; SM 160-4X

*Note 3 - R12 is 900 ohms, Part no. 115-1195 in following Models:
SM 325-0.5X; SM 325-1X; SM 325-2X

REPLACEMENT PARTS MAY BE ORDERED FROM KEPCO, INC. ORDERS SHOULD INCLUDE KEPCO PART NUMBER AND DESCRIPTION.

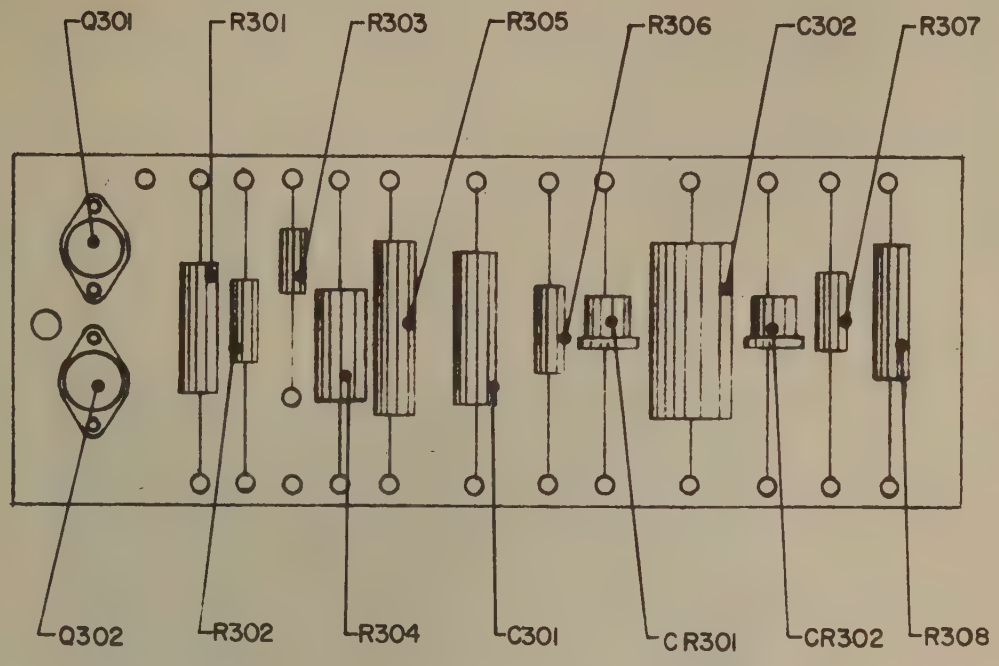
PLEASE NOTE: THE MANUFACTURER'S NAME AND PART NUMBER LISTED FOR EACH ITEM ON REPLACEMENT PARTS LISTS, REPRESENTS AT LEAST ONE SOURCE FOR THAT ITEM AND IS LISTED SOLELY FOR THE CONVENIENCE OF KEPCO EQUIPMENT OWNERS IN OBTAINING REPLACEMENT PARTS LOCALLY. WE RESERVE THE RIGHT TO USE EQUIVALENT ITEMS FROM ALTERNATE SOURCES. KEPCO, INC.

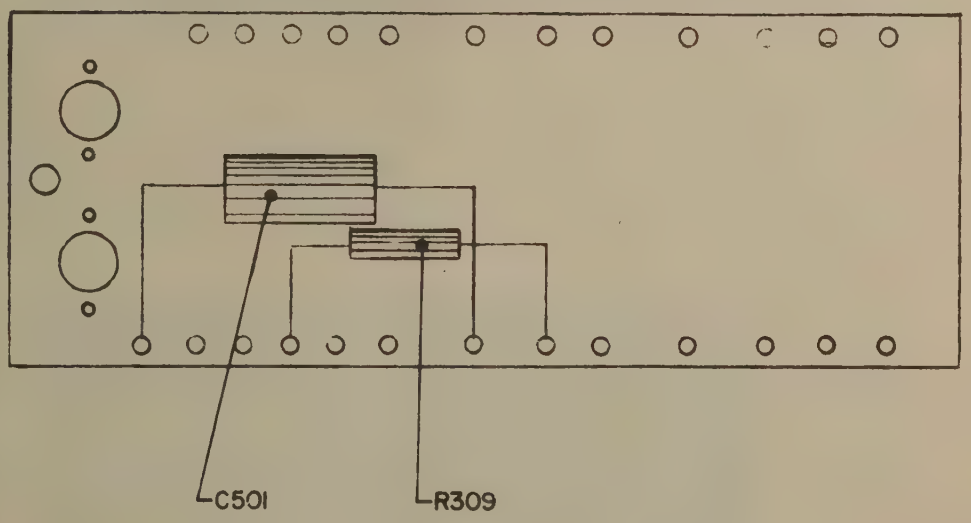




CORRECTIONS, IF ANY, APPEAR ON SHEET ATTACHED TO REAR COVER

KEPCO INC. FLUSHING NEW YORK	
ITEM POWER UNIT	DES 6-16-61
	APPD J.P.K.
MODEL SM-160-4	DFTM M.CEA
DWG No CM00956	CHKD

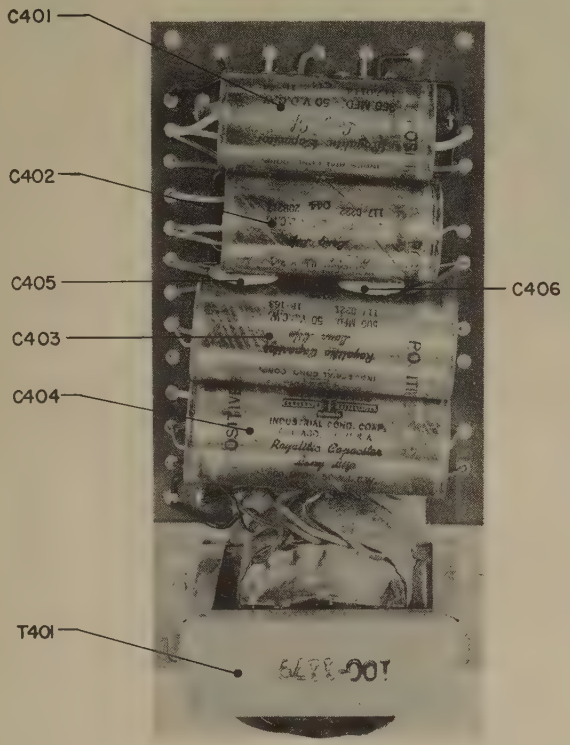


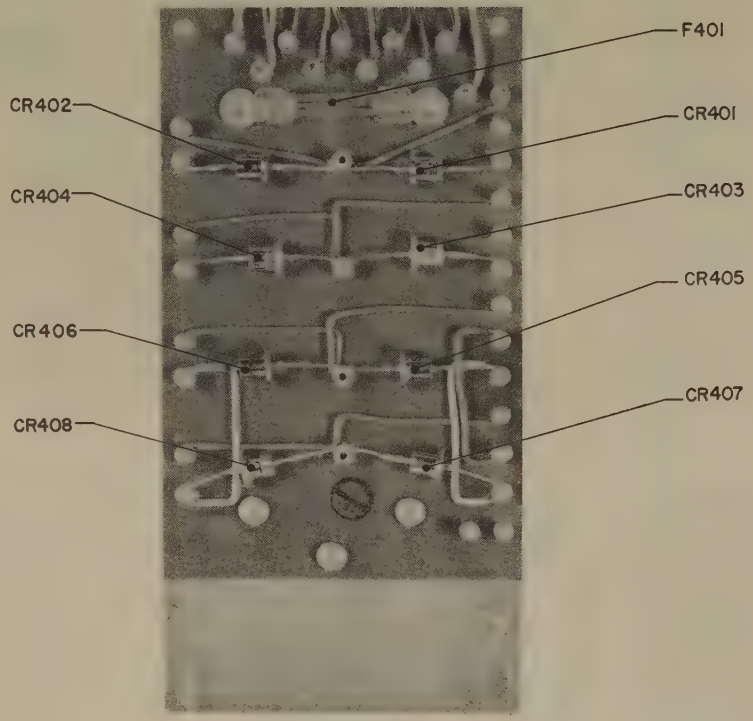


KEPCO INC.

FLUSHING NEW YORK

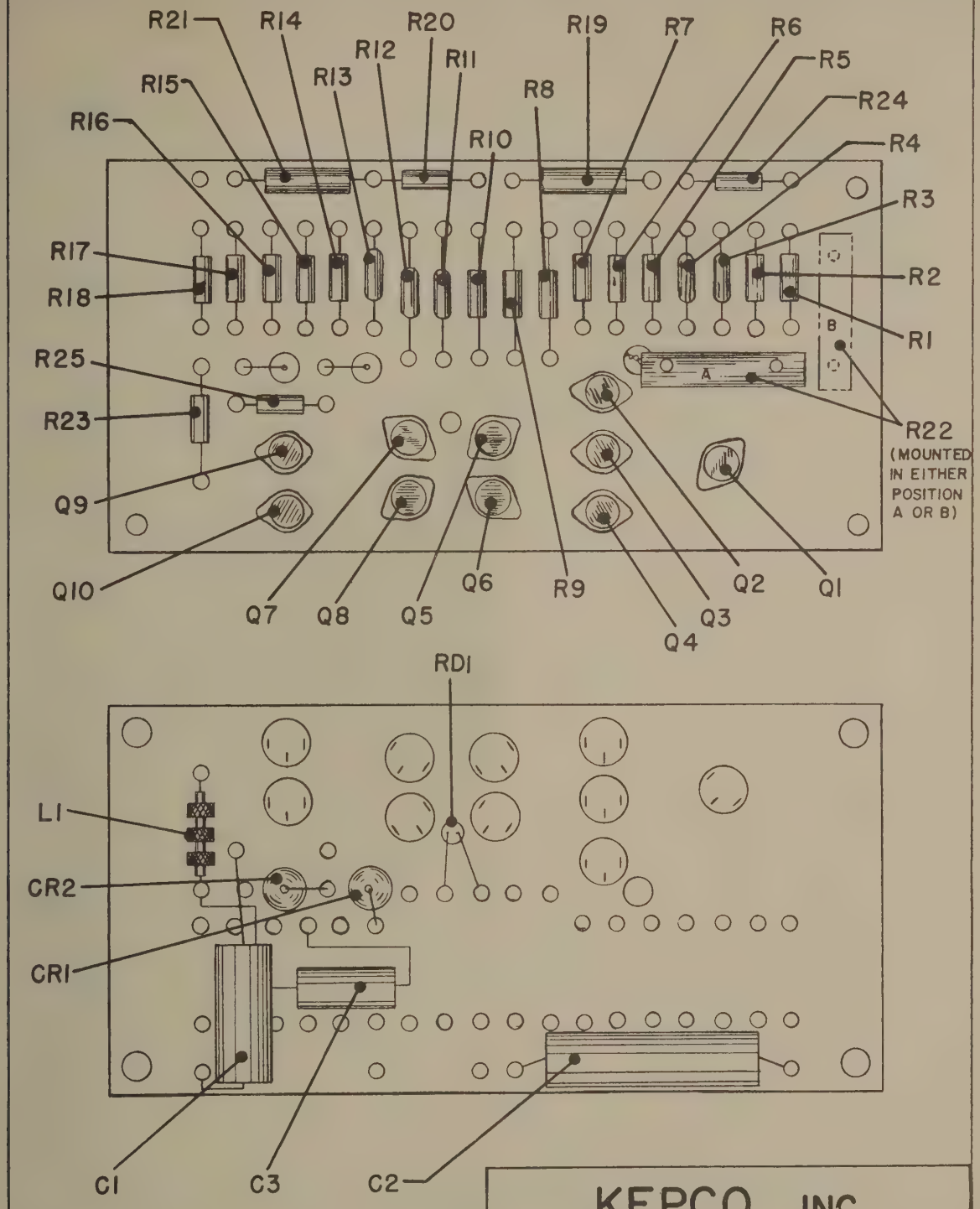
ITEM RB-1	DES 4-14-61
	APPD J.P.K
MODEL SM-160-4	DFTM R.C.
DWG No AM01242	CHKD T.R.



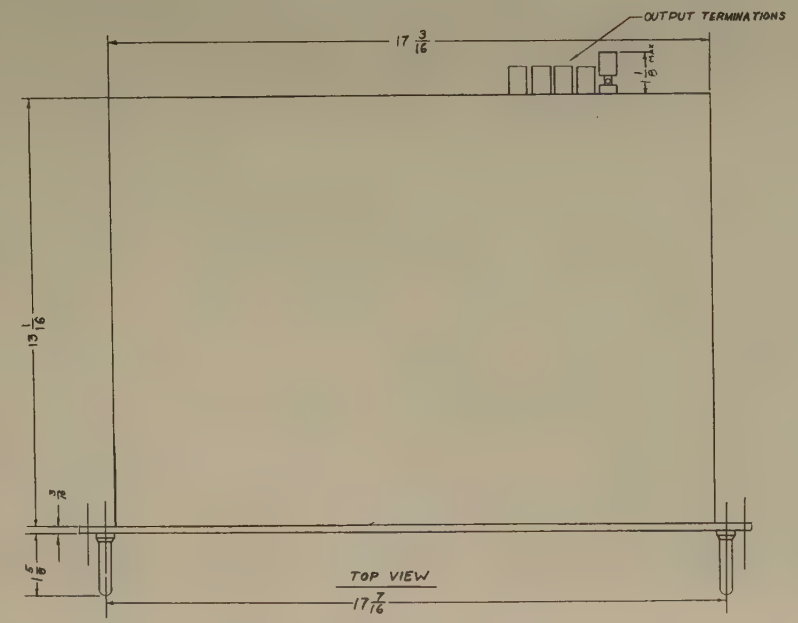


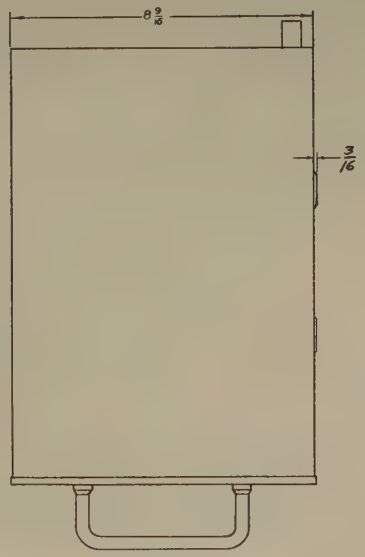
CORRECTIONS, IF ANY, APPEAR ON SHEET ATTACHED TO REAR COVER

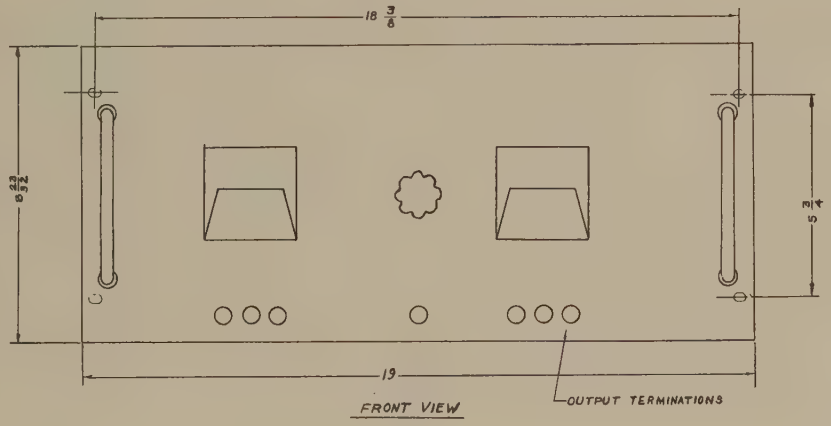
KEPCO INC.	
FLUSHING	NEW YORK
ITEM RB-2	DES. 1-3-61
	APPD
MODEL SM—— SERIES	DFTM M.CEA
DWG. No. BM00923	CHKD



KEPCO INC.	
FLUSHING NEW YORK	
ITEM CONTROL UNIT	DES. 12-6-61
	APPD
MODEL TRAM 31	DFTM M. RAYNER
DWG. No AM01809	CHKD







NOTE:
USED ON MODELS:

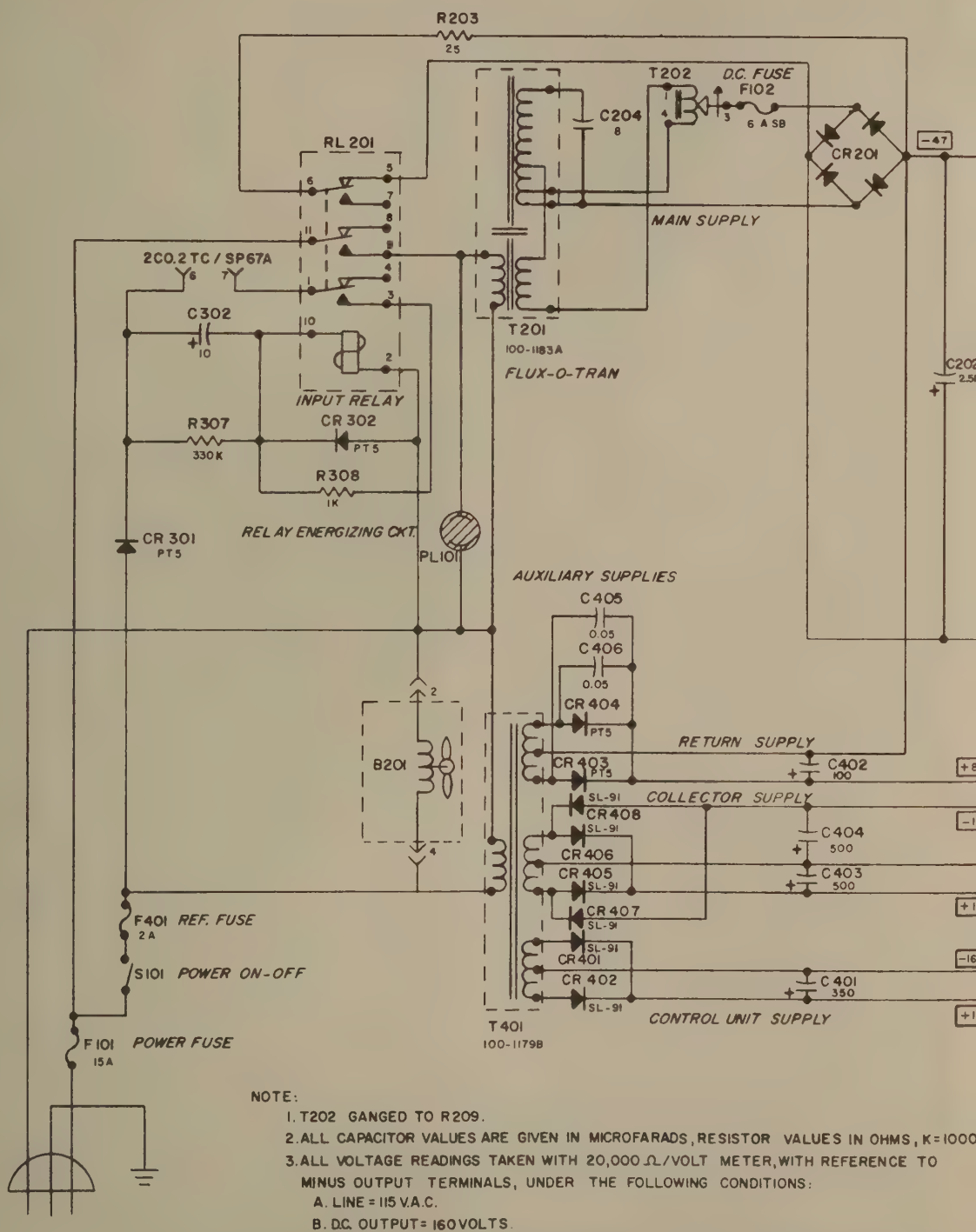
SM-36-15
SM-75-8
SM-160-4
SM-325-2

KEPCO INC. FLUSHING, N.Y.			
TITLE: OUTLINE DRAWING			
DRAWN: TV	CHECKED: JJK	APPROVED: [illegible]	DATE: 4-1-60
MODEL NO.: SM-8-3/4 SERIES		PART NO	SCALE: 1/4" = 1"
DWG. NO. C M00503			2

TOLERANCE UNLESS OTHERWISE SPECIFIED · FRACTIONS ± 1/64 DECIMALS ± .005 ANGLES ± 1/2°

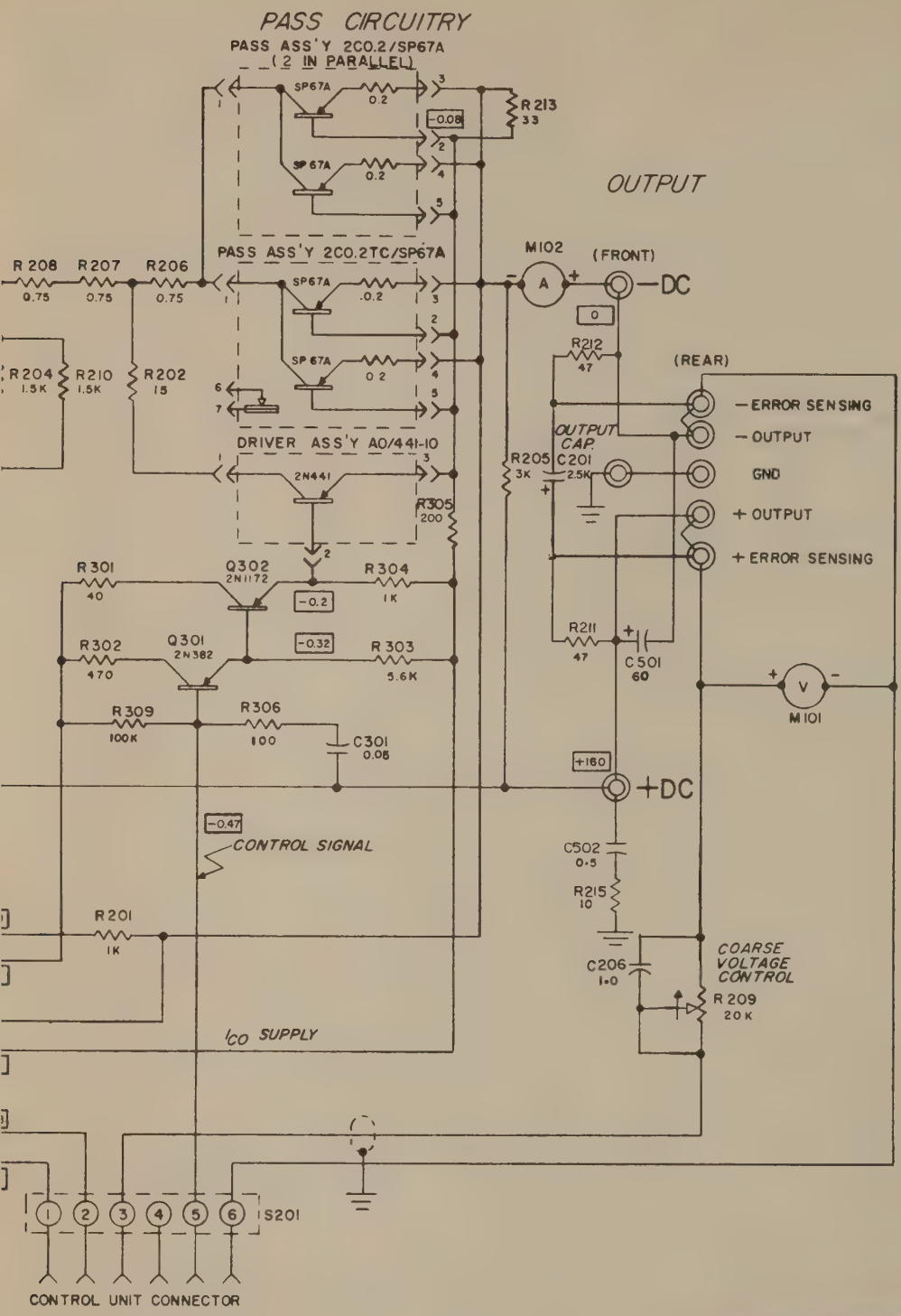
INPUT CONTROL

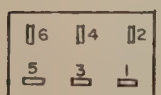
DC SOURCES



NOTE:

1. T202 GANGED TO R209.
2. ALL CAPACITOR VALUES ARE GIVEN IN MICROFARADS, RESISTOR VALUES IN OHMS, K=1000
3. ALL VOLTAGE READINGS TAKEN WITH 20,000 Ω/VOLT METER, WITH REFERENCE TO MINUS OUTPUT TERMINALS, UNDER THE FOLLOWING CONDITIONS:
   - A. LINE = 115 V.A.C.
   - B. D.C. OUTPUT = 160 VOLTS.
   - C. OUTPUT CURRENT = ZERO.
4. VOLTAGES ARE TYPICAL AND ARE SUBJECT TO NORMAL COMPONENT TOLERANCE.
5. METERS M101, M102 APPLY ONLY TO SM-160-4 M AND SM-160-4 MX MODELS.
6. ORDER REPLACEMENT PARTS BY KEPCO PART NUMBER PROVIDED IN PARTS LISTS SECTION.

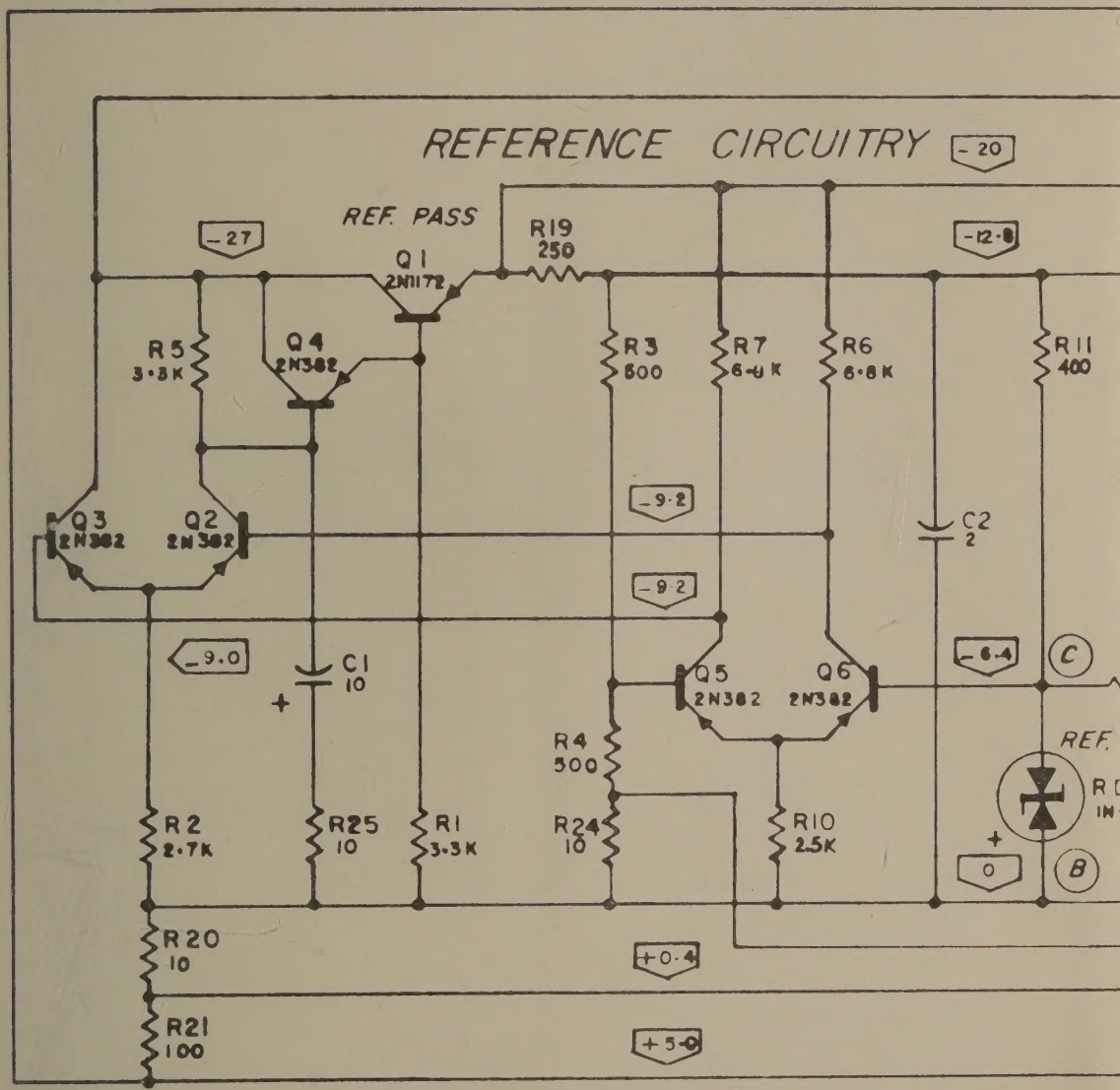




CONTROL UNIT CONNECTOR
SOCKET (WIRING SIDE)

KEPCO LABORATORIES
FLUSHING NEW YORK

ITEM: POWER UNIT	DES J.R.G.
	APPD 10-24-61
MODEL SM-160-4M	DFTR J.O.K.
DWG. No. C-M00439	CHKD J.F.K.



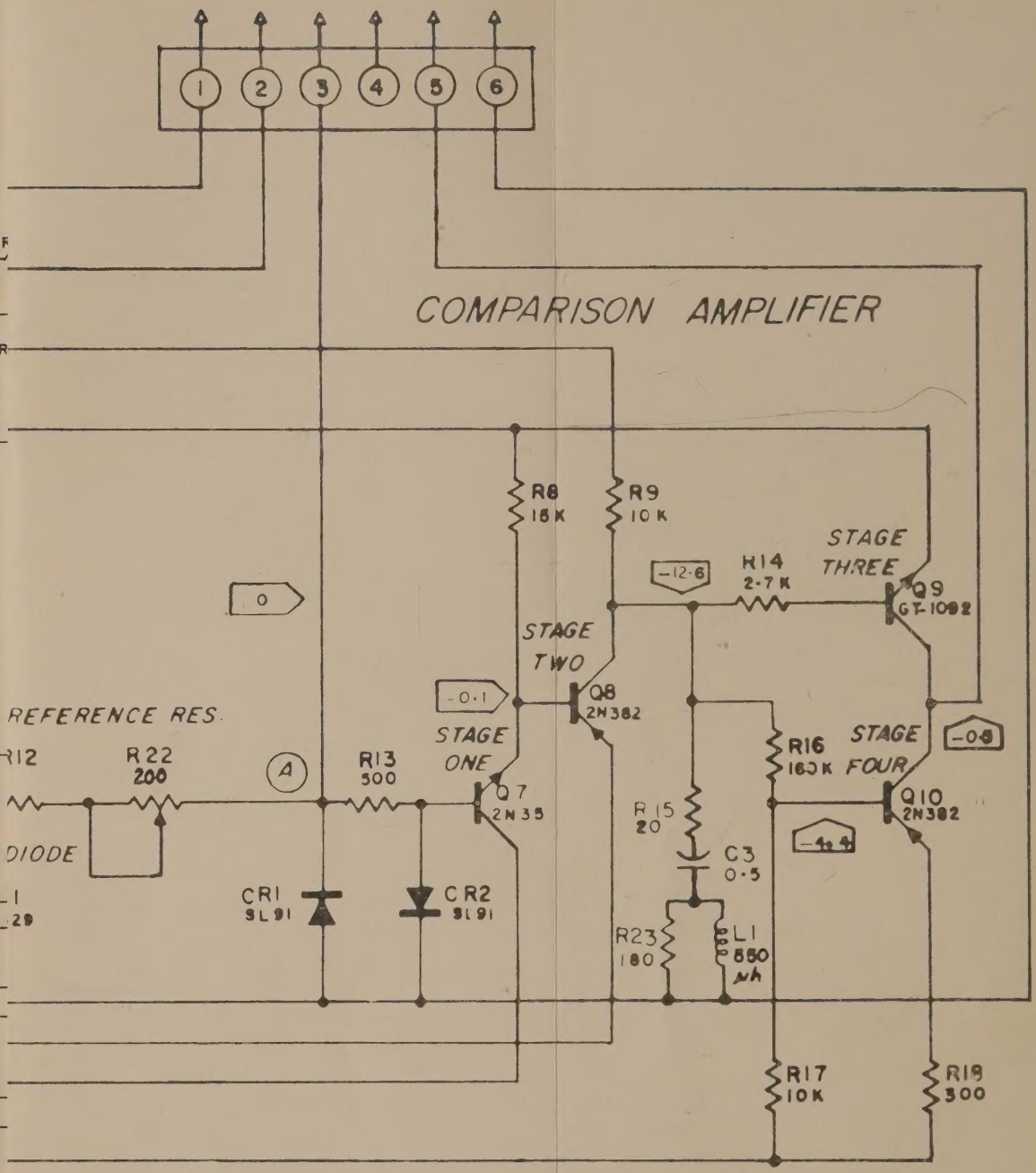
NOTE :

1. ALL VOLTAGES TAKEN UNDER CONDITIONS SPECIFIED ON MAIN SCHEMATIC.
2. ORDER REPLACEMENT PARTS BY KEPCO PART NUMBE PROVIDED IN PARTS LISTS SECTION.

(*) MODELS: SM14-7X; SM14-15X; SM14-30X; SM36-10X; SM36-5X; SM3

(**) MODELS: SM75-2X; SM75-5X; SM75-8X; SM160-2X; SM160-1X; SM

(***) MODELS: SM325-1X; SM325-2X



KEPCO INC.	
FLUSHING, N.Y.	
TITLE: CONTROL UNIT	
DRAWN: C. A.	CHECKED: P.K.
APPROVED: A. Rosenplenter	DATE: 4-20-62
MODEL NO.: TRAM - 31	PART NO.:
SCALE:	
DWG. NO.: B M00625	4

5-15 X

1160-4 X ; SM325-0.5 X

INSTRUCTION MANUAL CORRECTION

Please note the following changes to the Manual material as indicated:

Power Unit, Parts List and Schematic Diagram:

1. (c371)Change Resistor R307 from 82 K to: 330 K ohms, 1/2 w, 5%; Allen Bradley EB 3345; Kepco #115-0250. Delete Resistor R214 200 ohm ww Fine Control.

2. (c530) Change Resistors R 206-208 from 0.75 ohms 75 w to: Resistor, Fixed, Power, Ribbon, 0.75 ohms, 40 w, 5%; Hardwicke Hindle #2BR-35; Kepco #115-1016.

3. (c552) Add Rectifier Assembly Kepco #109-0040. Connected across terminals 1 and 3 of Pass Assembly terminals, Zener positive to terminal 1.

INSTRUCTION MANUAL CORRECTION

Please note the following changes to the Manual material as indicated:

Power Unit, Parts List and Schematic:

1. The two resistors, 47 ohms, 1/2 watt each, connected one from each Output terminal to its respective Error Sensing terminal, have been changed to: Resistor, Fixed, Power, Axial, 50 ohms, 3 w, 5%; Ward Leonard 3X50; Kepco #115-0641.

2. Silicon Diode CR 302 (PT-5) has been replaced by a resistor R 320; Resistor, Fixed, Axial, 2500 ohms, 3 w, 5%; Kepco #115-0469; Ward Leonard #3X2500.

SM/7-1862 rev.

kepco Inc.®

131-38 SANFORD AVENUE • FLUSHING 52, N. Y. • Area Code 212 IN 1-7000 • TWX # NY 4-5196

146-0045 - 1/62 - 12M